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MEMOIRS

OF THE

GEOLOGICAL SURVEY

OF

THE UNITED KINGDOM.

Figures and Descriptions

ILLUSTRATIVE OF

BRITISH ORGANIC REMAINS.

DECADE I.-VI

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1849.

N O T I C E.

PALÆONTOLOGICAL researches forming so essential a part of geological investigations, such as those now in progress by the Geological Survey of the United Kingdom, the accompanying plates and descriptions of British Fossils have been prepared as part of the Geological Memoirs. They constitute a needful portion of the publications of the Geological Survey, and are taken from specimens in the public collections, or lent to the Survey by those anxious to advance this branch of the public service. Although numerous drawings had previously been made, and engravings from them considerably advanced, it was not thought expedient to commence their publication until the large collections of the Survey could be well examined, which a want of the needful space has, until the present time, considerably retarded. This impediment to progress is now being removed, and when the collections can be properly displayed in the New Museum of Practical Geology, in Jermyn Street, it is hoped that the public will have an opportunity of gradually obtaining, in a convenient manner and at small cost, a work illustrating some of the more important forms of animal and vegetable life there preserved, and which have been entombed during the lapse of geological time in the area occupied by the British islands.

The plan proposed to be followed in the work, of which the two Decades now published form a part, is as follows:—

To figure in elaborate detail, as completely as possible, a selection of fossils, illustrative of the genera and more remarkable species of all

classes of animals and plants the remains of which are contained in British rocks ; to select especially such as require an amount of illustration which, to be carried out by private enterprise, would require a large outlay of money, with little prospect of a return, and a long time to accomplish, but which, by means of the staff and appliances necessarily employed on the Geological Survey, can be effected at small cost, and with a rapidity demanded by the publication of the maps and memoirs of the Survey ; thus, it is hoped, affording an aid to those engaged in the sciences with which this work is connected, that they might not otherwise have possessed, and which may materially promote the progress of individual research.

H. T. DE LA BECHE,
Director-General.

Geological Survey Office,
24th May, 1849.

BRITISH FOSSILS.

DECADE THE FIRST.

THE first Decade of representations of British Fossils is devoted to a selection of Echinoderms, of the Orders *Asteriadae* and *Echinidae*.

With the exception of the *Crinoidea* and *Cystidea*, no special monographs have been devoted to the illustration of our fossil species of Echinodermata, notwithstanding their acknowledged importance in a geological point of view. The majority of species found in British strata are unfigured in British works; a very great number are not figured at all, and those of which we possess British figures are, for the most part, delineated either imperfectly or insufficiently for the demands of science in its present state. This is the more remarkable since, for the description and delineation of numerous species, ample materials exist in collections.

Of the following plates, one is devoted to figures of all the Silurian star-fishes as yet discovered in British strata. None of these have hitherto been represented in any work. Their names only, accompanied by short descriptive characters, have appeared in the "Synopsis of British Fossil Asteriadae," contained in the second part of the second volume of the "Memoirs of the Geological Survey of Great Britain." Some remarkable new forms of star-fishes from the Oolites, and all as yet discovered in the London clay, are figured in the second and third plates.

The fourth plate is devoted to a representation of the only fossil as yet discovered of the family *Euryales*, now for the first time described and figured, through the kind co-operation of the Rev. Professor Sedgwick.

In the six following plates a series of illustrations of the British fossil *Echinidæ* is commenced, of the majority of which, even the commonest and those most important for the identification of strata, no good representations are accessible to the student of English fossils. The importance of a knowledge of the members of this family to the explorers of oolitic and cretaceous strata cannot be too strongly insisted on, and their beauty and interest, in a purely Natural History point of view, render them admirable subjects for elaborate delineations.

When the collections accumulated during the course of the progress of the Geological Survey have been thoroughly examined and arranged, new light may be expected, bearing on the details of structure of the species now figured. Additions will consequently be made to the plates from time to time; and it is proposed to issue supplementary figures of the variations of form exhibited by the several species selected as subjects for these decades.

EDWARD FORBES.

May, 1849.

BRITISH FOSSILS.

DECADE I. PLATE V.

SALENIA PERSONATA.

[Genus SALENIA. GRAY. (Sub-kingdom Radiata, Class Echinodermata, Order Echinidæ. Family Cidarites.) Body subglobose. Interambulacral segments very broad, bearing (few) primary imperforate tubercles; ambulacral areas very narrow, without primary tubercles; pores in single file; summit crowned with a complicated anal disk, composed of five ovarian and five ocular plates, and one supra-anal plate; anus excentric; spines of two orders, the primaries long, slender, and cylindrical.—I regard the genera PELTASTES and GONIOPHORUS of AGASSIZ, as sections of the genus SALENIA.]

SYNONYMS. *Echinus petaliferus* (DESMAREST, MSS.), DEFRANCE, in the 37th volume of the Dict. des Sciences Naturelles, p. 101 (1825) [it had previously been clearly figured, but without a name, by PARKINSON, in the 3rd vol. of "Organic Remains," pl. 1, f. 12]. *Echinus areolatus*, KÖNIG. Icones Sectiles (1825), Fig. 100 (wrongly so named, not being the species of Wahlenberg). *Cidaris scutiger*, MUNSTER in GOLDFUSS, Petref. Germ., p. 120., pl. xlix., f. 4 (1826). *Salenia scutiger*. GRAY, Zool. Proc., part 3, for 1835, p. 58. *Echinus* (*Salenia*) *petaliferus*, ROEMER, Verst. Nord Deutschen Kreide-Geb. (1840), p. 30. *Salenia scutigera*, AGASSIZ, Echin. Suiss., ii., p. 89, t. 23, f. 1-5, and Monog. des Salenies, p. 12, t. 2, f. 1-8? *Salenia personata*, AGASSIZ (who states that it is the MSS. *Cidaris personata* of DEFRANCE), Monog. des Salenies, p. 7, f. 1-8. *Salenia petalifera*, AGASSIZ, Monog. des Salenies, p. 9, t. 1, f. 17-24. *S. personata* and *S. scutigera*, AGASSIZ and DESOR, Cat. Raisonné des Echinides, Annales des Sc. Nat., 3rd series, Zool., vol. vi., p. 341 (1846).

Probable variety. *Salenia gibba*, AGASSIZ, Monog. des Salenies, p. 13, t. 2, f. 9-16.

DIAGNOSIS. *S. testâ suborbiculari, dorso subdepresso, areâ anali magnâ, assulis lævigatis, suturis assularibus punctatis, punctis parvis circularibus seu triangularibus, margines assularum vix denticulantibus; areis interambulacralibus in medio late granulosi.*

In lettering our plate *Salenia personata*, we follow the nomenclature of the general catalogue of Echinidæ by Agassiz and Desor, but do so not without doubts of the justice of the nomenclature therein proposed,

and can certainly offer no objections to the adoption of the specific appellation *petalifera*, in preference to the other names cited in our synonyms.

Parkinson gave a creditable figure of this curious sea-urchin, along with that of another and very distinct species (the *Salenia ornata* of Agassiz, MSS.), which has often been cited by mistake as identical with its companion. Defrance identified a French species with Parkinson's, and adopted Desmarest's manuscript name of *petalifera*. It would appear, however, from the statement of Professor Agassiz, in his monograph of *Salenia*, that Defrance himself used the name *personata* for a fossil which the distinguished naturalist of Neuchatel regards as the type of the species before us. The *Salenia* figured by Goldfuss, under the name of *Cidariscutiger*, does not seem to me to differ essentially from our British species, and I cannot see those distinctions which Agassiz has pointed out between it and the one we figure, at least in Goldfuss's excellent representation; though that figured by Agassiz himself as *scutiger*, certainly presents differences, especially in the indentations of the sutures of the anal plates, which may indicate a distinct variety if not species.

Description.—Body subglobose, depressed above, divided into five equal portions by the five series of ambulacral plates, which stand out rather more prominently than the interambulacra. Anal disk broad and slightly convex in some specimens, much more so than in others; its outline is slightly sinuous. The centre of it is occupied by the supra-anal plate, which is of a hexagonal shape, broader than long, prominent dorsally and centrally, excavated in form of crescent to make the anterior margin of the anus. In front of it is the anterior ovarian plate, lyrate oblong, longer than broad, broadest posteriorly and centrally, perforated in the centre by a large ovarian pore. The lateral ovarian plates are similar in form, but rather shorter. All have their frontal or free margins prominent in the centre. The posterior ovarian plates resemble the others, except that their superior and inner angles are truncated crescentically, and strongly margined, to go towards the formation of the anal rim. They are all perforated by ovarian pores, more or less margined. In many specimens the anal rim partially encroaches on the posterior ovarian pores. The ocular plates are of much smaller dimensions, transversely and subtriangularly oblong, their inner sides forming the prominent portions of the triangle, and their frontal margins the bases. Their inner sides unite with the inferior and lateral parts of the neighbouring ovarian plates, the superior and lateral parts of which unite with each other, and their superior margins with the supra-anal plate. At the angles of junction of every three plates is a deep excavation or punctation, and another in the centre of the line of union between every two plates. Thus there are nine punctations around the borders of the three anterior ovarian plates, six around each of the pos-

terior ovarians, and three around each of the oculars. The pits at the junction of three plates are triangular, those at the junction of two, circular. They are never prolonged as linear notches into the substance of the plates. The surfaces of the latter, in a few rare specimens, exhibit indistinct indications of radiated ribbing. The anus itself is subcircular, slightly inclining to transversely oval. It is bordered by a very prominent rim, formed of the elevated margins of the posterior ovarian and supra-anal plates. The sutures of parts of the rims appear in many specimens as if consolidated.

The ambulacra are composed of two slightly sinuous poriferous grooves, and separated by the ambulacral spaces. The latter are narrow, and through a great part, of nearly equal dimensions. Each ambulacral plate bears a marginal tubercle, and one or two smaller ones on its inner or central side. The marginal tubercles, being nearly of an equal size, form a closely ranged border to the ambulacral spaces; the interspace between the borders is occupied by alternating tubercles of smaller dimensions. The poriferous avenues are depressed and very narrow. The pairs of pores are ranged in single file, except immediately near the mouth, where they are double and triple ranked. Each pore is separated from its fellow by a rather prominent ridge. The interambulacral spaces are, in their centres, three times the breadth of the ambulacra. They are composed of few plates, some of which bear areolated spaces, surrounding primary spiniferous tubercles. These are borne on elevated prominences, which form a dentated margin around their bases. The primary tubercles are not equal in diameter to the breadth of the rings surrounding them. The edges of these circles are bordered by a rather scattered series of secondary tubercles, usually about seven in number. Of the primary tubercles and their areolæ, there are three most conspicuous on each interambulacral area, two to the left, and one, nearly central, on the right side. Down the centre of each interambulacral area runs undulating an elevated, but plane space, occupied by tertiary tubercles, closely and rather irregularly set, bordered by the secondary tubercles which bound the rims of the areolæ. There are no tertiary tubercles in the spaces between one areola and another of the same vertical series.

The mouth is round, and not very large, as compared with the diameter of the body. Its margin is deeply notched opposite each poriferous suture, and sinuated in the interambulacral intervals. It is bordered all round by a more or less thickened rim.

In a well-grown specimen there are about 38 pairs of pores in each series, and about 18 bordering secondary tubercles on each side of an ambulacral space.

As yet the spines are unknown.

Dimensions of a well-formed example.

Diameter	$0\frac{9}{12}$ unc.
Height	$0\frac{5}{12}$,,
Breadth of anal disk	$0\frac{8}{12}$,,
Breadth of an ambulacral area	$0\frac{1}{12}$,,
Breadth of an interambulacral area	$0\frac{4}{12}$,,
Breadth of mouth	$0\frac{3}{12}$,,

Locality and Geological Position.—Plentiful in the UPPER GREEN-SAND at Warminster. (Survey Collections.)

Foreign Distribution.—In the Craie chloritee of France, Bavaria, and Minorca, and Hills-conglomerat of North Germany.

EXPLANATION OF THE PLATE.

Figs. 1, 2, and 3. Upper, under, and lateral views of a Warminster specimen. Fig. 4. Genito-anal disk. Fig. 5. Two ambulacral areas, and one interambulacral greatly magnified. Fig. 6. Arrangement of the pairs of pores near the mouth. Fig. 7. Ambulacral plates and pores. Fig. 8. Relative arrangements of ambulacral and interambulacral plates. Fig. 9. An interambulacral plate, with its tubercles. Fig. 10. A primary tubercle seated on its pedicle, with the surrounding secondary tubercles, seen in profile.

E. FORBES.

April, 1849.

